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Reports
Patla,
S. M.

NORTHERN GOSHAWK MONITORING PROJECT REPORT

1989

TARGHEE NATIONAL FOREST
St. Anthony, Idaho

Susan Patla, contractor
P.O. Box 505
Driggs, Idaho 83422

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NORTHERN GOSHAWK MONITORING PROJECT 1989
Targhee National Forest

I. INTRODUCTION

The northern goshawk (Accipiter gentilis atricapillus), largest of the three accipiter species inhabiting North America, occurs throughout the mountainous west from Alaska south through Canada down to Arizona and New Mexico (Appendix A; Jones, 1979). With short, rounded wings and long tail, the goshawk is adapted for agile flight through forests and woodlands, and preys mainly upon birds and mammals associated with such habitats (Reynolds, 1987). Many recent studies on the vegetative and topographical features of goshawk nesting sites have shown that preferred nesting habitat is large stands of mature and old-growth coniferous, deciduous or mixed forest with high canopy closure and an open understory located on moderate slopes (Bartelt, 1977; Hennessey, 1978; Shuster, 1980; Reynolds et al, 1982; Saunders, 1982; Hall, 1984; Kennedy, 1985; Crocker-Bedford and Chaney, 1988; Woodbridge, 1988). Timber harvesting of older aged forest stands in the west has lead to concern over possible impacts on local goshawk breeding populations (Reynolds, 1983; Mannon and Meslow, 1984; Bloom et al, 1986).

Regulations implementing the National Forest Management Act (NFMA, 1976) require all national forests through their planning process to identify management indicator species (MIS) whose population changes are believed to indicate the effects of land management activities. Included in the five categories of species to be selected as MIS are three which relate specifically to the goshawk: 1.) species with special habitat needs that may be influenced significantly by planned management programs 2.) non-game species of special interest, and 3.) species whose population changes are believed to indicate the effects of management activities on other species of selected major biological communities (36 CFR 219.19(a)(1). A list of national indicator species in the Resources Planning Act Program (RPA) includes the goshawk as a species with special habitat needs for mature/over-mature forest conditions (FEIS, RPA, 1986). A survey of national forest plan Final Environmental Impact Statements indicated that approximately 49 national forests list the goshawk as a MIS because of special habitat needs and/or as an ecological indicator of mature or old-growth forests.

The Targhee National Forest on the southeastern border of the Greater Yellowstone Ecosystem is one of the national forests which selected the goshawk as a management indicator species (MIS) for mature and old growth forest habitat (Targhee Land and Resource Management Plan, 1985, p. 557) Population size of the goshawk on the forest is estimated to be 40 pairs and tending downward. Based on an estimated habitat unit of 15 square miles,

potential population size on 870,000 acres of habitat is calculated to be 90 pairs. Minimum viable population size is estimated to be 36 pairs (Final Environmental Impact Statement, LMP, 1985, pp. 77-78). Methods of monitoring the goshawk were identified as 1.) monitor habitat via biologist analysis of all timber sale Environmental Analysis (EA's), and 2.) maintain Forest-wide record of all active nest sites as they are found (LMP, p.557).

The Five Year Monitoring Report (1988) summarizes goshawk data collected on the Targhee NF from 1981-1986. A total of 16 nest sites were located, ten of which subsequently suffered disturbance from timber harvesting or road building activity. The report concluded that the goshawk monitoring program was incomplete for two reasons: nests were only found during timber layout activities resulting in a biased sample, and known nest sites were not being revisited annually to document use. Future action called for determining "if the goshawk is a practical indicator for mature and old growth habitat, and if specified methodology in Monitoring Plan is appropriate." (p.3-41)

In the summer of 1988, under the direction of Mary Maj, assistant ranger on the Teton Basin District, a volunteer monitoring effort began to explore methods for monitoring known nest sites and timber sale areas. As a result of this initial effort, a contract (#43-0282-8-1931) was issued on 9/17/88 to recheck known nest sites on the Targhee Forest to collect data on occupancy, productivity, habitat characteristics, and prey base. The collection of baseline data on habitat and productivity in 1989 is considered to be phase one of the monitoring program. Phase two is to be a more in-depth assessment of cause and effect after further collection and evaluation of baseline information. This report presents the data collected during the 1989 field season.

II. METHODS

The original contract specified that the goshawk monitor would check 15 historic nest sites and, if found unoccupied, search for alternate nests within a 1/4 mile radius (Appendix B). Taped vocalizations of the goshawk including adult alarm calls and immature food-begging calls were to be used to elicit responses in areas where a nest could not be located. The monitor would also search for prey remains as an indication of occupied territories. It was estimated that an average of three days per site would be needed.

(Note: Throughout this paper the terms "nest site" and "nesting territory" will be used interchangeably. Both indicate the area immediately surrounding the nest which the female goshawk defends and which the fledglings (young birds which have recently left the nest and still depend upon the adults for food) use during the nesting season. "Home range" will be defined as

the spatial area necessary for all life requirements; this includes foraging areas and is usually many square miles large. The nesting territory is included within the home range.)

Further fieldwork, research and discussions in early 1989 with the contract administrator, Mary Maj, resulted in some modifications and expansions of the original proposal. It was decided that a training program should be developed for district summer employee orientation programs to acquaint field personnel with the goshawk. A slide show was presented at all five districts in early June. Follow-up, when possible, on all reported sightings during the season became an important part of the monitoring effort.

A review of historic nest site data also suggested that some of the contracted 15 territories no longer contained suitable nesting habitat due to habitat alteration resulting from timber harvesting. District biologists were asked to review their records in early 1989 and determine the priority of areas to be monitored on their respective districts. Following initial site visits in June to proposed areas, a revised list of monitoring sites was developed (Table 1). The number of sites was expanded from 15 to 33 with a sliding scale of monitoring intensity. All sites were rated in Table 1 according to the following status key:

1. Active site* 1989
2. Active site prior to 1989
3. Nest found--not active
4. Adult goshawk observed--defensive reaction
5. Adult goshawk observed--repeatedly in same area
6. Adult goshawk observed-- one time
7. Immature goshawk observed
8. Unidentified accipiter seen or heard

TS timber sale area

*Active site is an area where an active nest or young of the year has been found.

Monitoring effort was determined by site status evaluation. Following is the key for monitoring effort in Table 1:

0 No site visits scheduled.

1 Site check--visit area 1-2 times to check old nests or observation locations and survey habitat type.

2 Nest monitoring--recheck active nest sites as needed to collect data on nesting chronology, prey base, and goshawk behavior.

TABLE 1 . PROPOSED GOSHAWK MONITORING SITES, TARGHEE NF, Revised 6/89

DISTRICT	MONITORING SITE	STATUS KEY*	MONITORING KEY*
D-1 Dubois	Kay Creek TS	1	2
	Sheep Creek	2	3
	Alex Draw TS	1,2	2
	East Rattlesnake TS	2	1
	South Three Mile	3	1
	Pasture Creek TS	6	1
	S. Fork Deep Creek	3,5	1
	Fritz Creek Trail	4	1
	Pete Creek	3	0
	Picnic Hollow	3	0
	Moose Creek	3	0
D-2 Island Park	Taylor Carrot TS	3,TS	3
	Walking Fish TS	3,TS	3
	Tyler Creek TS	3,TS	3
	Howard Creek	7	1
	Green Canyon Rd.	6	1
	Road 085	5	1
	Icehouse TS	TS	0
	Hotel/Yale Creek TS	TS	0
D-3 Ashton	Fall River Ridge	1	2
	Lower Goose Lake	5	3
	Long Meadows	5	3
	Thompson Hole	5	3
	Boundary Pond	3	1
	Anderson Mill	2	1
	Road 112	2	0
	Road 724	2	0
	N. Antelope	2	0
D-4 Palisades	Ruby Creek	1,2	2
	Limekiln TS	TS	3
	Sheep Creek TS	TS	3
	Argument Ridge TS	TS	3
	Mike Spenser	2	3
	Dry Canyon	2	1
	Long Canyon	2	1
	Water Canyon	2	0
	Small Sales Areas	TS	0
	Palisades Resevoir	5	0
D-5 Teton Basin	Canyon Creek TS	4,TS	3
	Kirkham Hollow TS	4,TS	3
	Aspen Trail/Darby Canyon	5	3
	Pole Canyon	7	1
	Teepee Creek	3	1
	Grandview TS	2	1
	Dry Creek TS	2	0
	Mike Harris/Trail Cr.	5	0
	Teton Canyon	5	0

*see text (p. 3) for key descriptions

3 Habitat monitoring--visit a potential nesting area or timber sale 2-3 times and thoroughly monitor for active and alternate nest locations.

In areas of known nests, the monitor would make a thorough attempt to locate the nest tree to check occupancy before playing taped calls at a site. If no birds were found at the nest, then tapes would be played at regular intervals while suitable habitat within 1/4 to 1/2 mile around the nest would be searched. In timber sale areas, transects were spaced throughout marked units as determined by terrain and area to be covered. The monitor, while walking transects, would play taped calls every 5-10 minutes and search for nests, birds, and prey remains.

Two levels of habitat data was collected: 1.) Nest tree data collected at all active and assumed alternate nest sites included nest tree species, height, age, DBH, elevation; nest height and aspect; and slope position, percent and aspect. 2.) Nest stand data was collected at all current active nest sites in addition to nest tree data. Within a 66' radius around the nest tree, all tree species type and DBH were recorded. (To calculate trees per acre a factor of 3.18 was used.) Also recorded were number of snags and seedlings, ocular estimate of canopy cover, and distances to permanent water sources and alternate nests if any. Earlier existing goshawk habitat data on Targhee nest sites has also been incorporated into this report when possible. Goshawk nest site habitat data had been collected prior to 1989 by Lew Becker (D-5) and Mary Maj (D-1).

III. RESULTS

A. Monitoring Effort:

Goshawk sites were surveyed from June to mid-October, 1989, with most of the effort concentrated in July and August. Appendix C lists the dates of site surveys for each district. Final total project hours summed up to 466 which included: 310 hours (66%) for field surveys, 144 hours (31%) for travel time, and 12 hours (4%) for training. Fifteen overnights were spent in the field. Road mileage totalled 6099 miles. Thirty- two different areas were surveyed on the forest. Total hours spent on each district varied according to the number of previously reported nest sites, and the number of current sightings from each district:

DISTRICT	# SURVEY HOURS	PERCENT TOTAL
D-1	93	30.0%
D-2	67	21.6
D-3	42	13.6
D-4	59	19.0
D-5	49	15.8

Forest service personnel reported over 30 individual sightings of goshawks or other accipiters during the summer season (Table 2). Three of these sightings resulted in locating new active goshawk nest sites. Four Cooper's and three sharp-shinned hawk nest sites were also found (Table 3).

B. ACTIVE NEST SITES 1989

A total of eight active goshawk territories were located in 1989 on the Targhee National Forest (Table 4). (Note: in order to protect nest site locations Table 3 and 4 are not included in this final draft. Copies will be given to district biologists for filing at their respective offices.) Actual nest trees were found at six of these sites. Two sites are at reoccupied former nest trees, two are in areas where territorial adults had been sighted in previous years, and four sites are new for the forest. Of these new sites, four are located in timber sale units; two of these units had already been sold, the other two had recently been laid out. The number of young goshawks fledged ranged from 1-3 per nest, resulting in an average of 2.0 per nest. Only one nest failure occurred. Following is a description of the 1989 sites. As little data exists on the biology or breeding behavior of the Targhee goshawk population, I have included extensive field notes taken at 1989 active nest sites.

1.) Alex Draw Unit 17 (D-1): a nest with one young was first discovered here in 1983 during environmental assessment for a Douglas fir shelterwood cut of 1,870 acres. The nest remained in good shape but surveys in 1984, 1985 and 1988 found no birds at this site. Road building took place in the area in 1986, logging in 1987, and slash and pile operations in August 1989. A buffer of trees was left around the nest tree but trunk injury occurred to this tree at some later time from heavy equipment operations. The buffer left is contiguous to uncut forest to the east; cut units are located to the north, south and west. The nest stand itself is a park-like old-growth area of widely spaced, large Douglas fir with grass groundcover located on a gentle slope above an intermittent drainage.

In 1989, this nest produced three young. The nest was discovered on 7/5 and the following observations were made:

7/05/89: the young lay quietly in the nest looking down at us.

TABLE 3. ACTIVE COOPER'S AND SHARP-SHINNED HAWK NESTS, TARGHEE NF, 1989

DATE FOUND	DISTRICT	LOCATION	TRS	NEST TREE SPECIES	# YOUNG FLEDGED	PREY ITEMS FOUND
		(see district biologist for complete table)				
SHARP-SHINNED HAWKS:						
08/19/89	D-1				4	
08/19/89	D-2			spruce	3	yellow-rumped warbler dark-eyed junco
08/20/89	D-5				4	yellow-rumped warbler woodpecker, sp. black-billed magpie
COOPER'S HAWKS:						
08/10/89	D-5			subalpine fir	3	chipping sparrow yellow-rumper warbler dark-eyed junco pellets
08/18/89	D-2			Doug fir	3	yellow-rumped warbler snowshoe hare
08/31/89	D-5			spruce	3	yellow-rumped warbler rodent
09/04/89	D-5				2	

TABLE 4. ACTIVE GOSHAWK NEST SITES, TARGHEE NATIONAL FOREST, 1989

DATE REPORTED	DISTRICT	TERRITORY	#YOUNG FLEDGED	AERIAL PHOTO #	TRS	REPORTED BY:
		(see district biologist for complete table)				
6/10/89	D-4	Ruby Creek	0			S. Patla
6/21/89	D-1	Kay Creek TS	3			B. Aber
6/28/89	D-3	Fall River Ridge	3			D. Acthaud
7/05/89	D-1	Alex Draw TS	3			L.Dedinado,S. Patla
7/17/89	D-3	MA 12 TS Unit	1			timber crew
7/26/89	D-1	Fritz Creek	2			S. Patla
8/03/89	D-2	Walking Fish TS	1			S. Patla
8/05/89	D-5	Canyon Creek TS	1			S. Patla

Occasionally as one rises to stretch, an obvious difference in size and plumage between the three young can be seen: one is completely downy white, one partially mottled black with a distinct black mark behind the eye and white eyeline (supercilium), and the largest has black wings, white leggings and white undertail coverts. This juvenile rises once and wing-flaps vigorously. No adults are heard or seen.

7/20/89: the young have left the nest. Two are seen a few hundred feet upslope of the nest tree; both alarm call at our arrival. One flies from tree to tree and another perches on a snag pile.

7/24/89: three young fly among the trees just north and northeast of the nest, alternating between alarm and food-begging calls. Their wing beats are very shallow and attempted landings awkward.

10/10/89: no birds are seen or heard.

Note: In contrast to other active areas visited, no adult birds were ever sighted or heard at Alex Draw during visits to the nest stand.

2.) Kay Creek Unit 21 (D-1): this is a new territory discovered in an active timber harvest area on 6/21/89 by a wor crew. The Kay Creek timber sale is a Douglas fir shelterwood cut of approximately 1400 acres. Timber sale units adjacent tc unit 21 were harvested this summer, but harvest was delayed in unit 21 to protect the nest site.

Unit configuration makes nest site buffer design difficult. In order to preserve the integrity of the nest site and a corridor to contiguous forest, a large volume of timber would have to be deleted from this unit. A tentative buffer was designed with input from Mary Maj, Dave Sleight, Kim Johnson and the monitor in fall 1989. This proposed buffer would delete 10.78 acres of timber from the unit with a volume/acre of 8563 (K. Johnson, pers. comm.). Negotiations with the timber company are scheduled for spring 1990.

The Kay Creek area is a very diverse mixed conifer forest containing a wide range of habitats within a small area. Open clearcut areas exist within one half mile to the west. A stand of small diameter lodgepole pine is located just west of the nest site. The nest tree itself is within a mixed Douglas fir stand which extends east and south upslope. Within this stand are a few huge old Douglas fir which the female goshawk was observed using as lookout perches on a few occasions. A park-like stand of old growth Douglas fir is located on top of the ridge to th south.

The nest tree is located on a bench at the base of a fairly steep ridge. A more gentle slope continues to the north down to Cottonwood Creek. A seasonal drainage passes to the west of the nest tree. This site appears to be a very secure area from both weather and visual detection. The remnants of an alternate nest exist in a Douglas fir eighteen feet from the active nest tree.

The following observations were made at the nest site:

6/21/89: An adult bird flies off the nest calling. It flies in circles around the nest tree for several minutes before landing in another treetop.

7/07/89: three downy mottled young are seen in the nest. As we approach, the female adult calls, flies overhead and then perches on top of the largest Douglas fir in the area. We move upslope of the nest 100' and sit down to observe the young. The female then circles behind us calling, lands on a snag and becomes quiet.

7/20/89: the young have fledged. Two are seen in small subalpine firs just downslope of the nest, one young obviously larger than the other. Both are very quiet until we observe them; then they give a few alarm calls. We can approach quite closely without the young taking flight. It appears that they are very weak fliers and have just recently left the nest. Their back feathers are colored a mottled black, buff and chestnut, offering excellent camouflage against tree trunks. Chests are heavily streaked. Later, the female adult flies in and perches directly overhead, alarm-calling. She then flies to the top of the tallest Douglas fir 100 feet from the nest tree. Many fresh prey remains are found upslope of the nest including the carcass of a tree squirrel and feet of a snowshoe hare.

7/25/89: no birds are seen or heard at 1100 when we enter the nest stand. A taped alarm call and begging call elicit no response. About 30 minutes later as we walk upslope of the nest, young birds start calling. The adult female flies overhead and perches briefly on top of a Douglas fir near us. One young flushes off the ground and flies awkwardly less than a foot overhead. Overall, two young are seen and another heard. One has a squeaky, higher pitched, weaker call than the other two. Prey remains are found in the area where the young are seen.

8/12/89: at 0830 two juveniles are sighted upslope 75 feet east of the nest tree. They fly overhead and from tree to tree alarm-calling and following us for about 3 minutes. Then they became completely silent. They have increased obviously in size and fly with strength and agility.

9/14/89: no birds are seen or heard for about 2 hours as we walk within the unit determining potential buffer boundaries; then a few calls are heard in the western section of the unit.

3.) Fritz Creek (D-1): this is a new territory discovered on 7/26 with 2 fledged young. The backcountry ranger in 1988 reported seeing a defensive hawk in this area on 6/19/88. One alternate nest was found in 1989 in a Doug fir with old grouse bones underneath, but the active nest tree was never found. The territory lies within a proposed wilderness area. Human activity is greatest here in the fall hunting season although some recent evidence of ORV use could be seen on the trail in July.

The habitat is mixed conifer but where the birds were sighted was in a pure Douglas fir stand on an intermittent drainage south of Fritz Creek. Steep slopes surround the drainage. Undercover growth is very sparse, duff covers the ground, canopy cover is over 90%, and much downfall exists. A small grassy meadow opening exists along Fritz Creek. Open sagebrush ridges are located to the north. Further west the Fritz Creek drainage narrows and begins to climb steeply. A pair of red-tail hawks was seen downstream. The site was visited twice:

7/26/89: an adult female goshawk alarm-calls from the slope south of the creek; two young food-beg, one north and one south of the creek. I find some whitewash under Doug fir trees in the side drainage but no obvious active nest.

8/13/89: an adult goshawk flies through the riparian zone about 1/8 mile east of former sighting. In response to the food-begging tape, a young goshawk calls from the north and flies over us in the meadow, landing in a tall Douglas fir. It keeps calling for a minute or so, then flies upslope to the southeast.

4.) Walking Fish Unit 9 (D-2): this new nest site was found in a timber sale unit that had been laid out earlier in the season. Walking Fish timber sale is 3100 acres of mainly Douglas fir shelterwood cut with a few units of clearcut lodgepole pine. All sale units were monitored for goshawks in early August. A few unoccupied stick nests were found to the west of unit 9 in other cut units. The entire area appears to be prime goshawk habitat. A few current sightings of great gray owl have also occurred within this sale area.

The nest site is in a Douglas fir stand of old-growth and mature timber located west of West Dry Creek. It is a park-like setting with large trees and sparse undergrowth. An old stock pond lies within 100' of the nest. An alternate nest was found in a fir located on the edge of the pond. To the north lies a wet area where elk were found wallowing in the fall. Located to the south east are stands of lodgepole pine designated as clearcut units.

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4.) Walking Fish Unit 9 (D-2): this new nest site was found in a timber sale unit that had been laid out earlier in the season. Walking Fish timber sale, currently under appeal, is 3100 acres of mainly Douglas fir shelterwood cut with a few units of clearcut lodgepole pine. All sale units were monitored for goshawks in early August. A few unoccupied stick nests were found to the west of unit 9 in other cut units. The entire area appears to be prime goshawk habitat. A few current sightings of great gray owl have also occurred within this sale area.

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On 8/29/89 a group of Forest Service biologists and district personnel visited the site with the monitor to discuss potential buffer lay-outs designed to protect the nest territory. An area of 10-15 acres was deleted from the unit which is contiguous with approximately 50 acres of uncut timber to the west. The unit was remarked in September. The following observations were made at this territory in 1989:

8/03/89: a young goshawk food-begging could be heard approximately 100 yards away. I find the juvenile with a grouse feather sticking to its bill sitting about 40' up on a horizontal branch in a tall Douglas fir. The bird has a buffy supercilium, blue-gray eyes, pale culmen, buffy chest with heavy dark streaks, fairly clear belly, and white undertail coverts with large dark streaks on the outer feathers. I sit down about 75' away. The bird vocalizes alternating between food-begging and alarm calls.

Five minutes later the bird flies to the west into a stand of firs. Then it begins screaming and flies into a fir. An adult goshawk flies out of this fir and perches in another fir 150' to the south. The adult preens and looks about. Then it flies to a tall snag. The juvenile begins to fly from branch to branch giving off a series of staccato screams. Then it takes off toward the adult screaming intensely. The adult disappears to the west. The young lands in the snag and continues to call for a few minutes. I later find fresh grouse feathers under the first adult perch. The active nest tree was later found about 150' to the east of this perch.

8/29/89: a group of nine people visits the site to design a buffer zone. While in the area for over 2 hours we do not see any birds and hear only one distant vocalization.

10/09/89: I return to take more habitat data. No birds seen; no fresh prey remains found in the area.

5.) Fall River Ridge (D-3): this new territory was found on 6/28/89 by forest biological technicians doing inventory of aspen stands. The nest tree is located near the top of a ridge in a pure stand of Douglas fir that covers a north facing slope. The surrounding habitat type is classified as POTR-PSME/AMAL (aspen, Douglas fir, serviceberry) which occurs on only 4% of the Targhee's aspen stands (G.Worden, pers. comm.). A broad spectrum of habitats lie within this area: the Fall River to the south with south facing sage covered slopes, Porcupine Lake to the west, old timber harvest units to the north, and extensive fir and aspen stands along the Fall River Ridge. No known management activities are planned for this area. The following visits were made in 1989:

6/28/89: the adult female goshawk screams and swoops at observers. The male perches in a snag about 40' away and

observes while technicians collect habitat data on aspen stand. They see the male later dive into the side of a large Douglas fir and fly off with a squealing red squirrel. After leaving the stand, they see an adult soaring above tree line.

7/11/89: I find the active nest with fresh whitewash underneath in a Douglas fir north of the aspen stand. No birds are in the nest, and the food-begging tape elicits no response. One unidentified bird then flies overhead. Later I play the alarm tape and the female adult flies in calling and perches 60'away. Then she flies to the top of the tallest fir just below the ridge top.

7/23/89: as we approach we can hear young goshawks food-begging almost 1/4 mile away from the nest area. They fly above us alarm-calling as we climb the ridge. Size differences between the three young are obvious as are distinct differences in tone and volume of their calls. They fly off to the east along the ridge line.

8/07/89: three young are still in the nest area. We can hear food-begging and alarm-calling down near the base of the fir stand. The three young fly upslope to the ridge top and disappear to the east.

9/02/89: no goshawks are seen or heard while we take habitat data. Some gray jays fly in and imitate goshawk calls in response to the alarm tape.

6.) Hominy Peak, MA 12 Small Sales Area, Stand 326/11 (D-3): this is also a new site for the forest. An adult goshawk vocalized at a work crew on 7/17/89. The nest and one fledged young were found on 7/28. The habitat is mixed conifer with a predominance of lodgepole pine. The nest is in a Douglas fir surrounded by lodgepole pine located on the side of a small knoll. About 100' to the west is a stand of old, large Douglas fir in an open grassy area. Jackass Loop Road is within 300'. This unit was included in the proposed MA 12 small sales area but subsequently deleted in July after further habitat assessment (G. Worden: pers. comm.).

7/28/89: at 1925, as I walk the west end of the sales unit, an adult goshawk flies overhead and perches above me. The bird appears to be a sub-adult. It has a black cap and gray face with no distinct supercilium; underparts are gray but more heavily barred than other adults seen this year. The undertail coverts are grayish and the voice is very different from all other adults heard--it is a high squeaky call similar to calls of some of the newly fledged birds.

The adult flies from pine to pine and then perches in a tall Douglas fir. When I play the alarm call, it flies in, perches

close and stares at me. One fledged young is found perching in a very skinny pine 40' from the nest tree. It has a heavily streaked, reddish chest, cresty head feathers, dark face and ve white undertail coverts with no streaking.

8/07/89: I find one adult and one young goshawk. Both perch in large Douglas fir trees south of the nest tree. The young calls a few times. The area contains a ripe huckleberry patch. Many red squirrels are heard and seen.

10/06/89: light snow on ground. No birds are seen or heard during an hour spent collecting habitat data.

7.) Ruby Creek (D-4): this lodgepole pine nest tree was used in 1986 and one young hatched. Fresh grouse feathers were found under the tree in August 1988. An adult in incubation posture was observed twice in early June, 1989, but no activity was noted in the area after that. A search for alternate nests proved unsuccessful. This area had been included in the Argument Ridge timber sale but was deleted from the sale in the mid 1980's after an appeal of the sale was filed. An abandoned work road passes within 40' of the nest tree.

The stand is predominantly lodgepole with scattered Douglas fir. It is located on a seasonal drainage south of Ruby Creek. An abundance of red squirrels were seen in the area. Leaning against the nest tree is a dead pine about one-half the way up the nest. (A graduate student at Utah State University reported finding a goshawk nest in the Wasatch Mountains of Utah in a lodgepole pine snag that also had a snag leaning against the trunk. Young goshawks were observed leaving the nest tree by hopping down this snag.) (William Stone, pers. comm.). The following visits were made to Ruby Creek:

6/10/89: After hiking into the area and playing the alarm call inadvertently within 150' of the nest tree, I see the nest with the head of an adult goshawk sticking just over the edge. She watches me but remains silent. Sometime during the following week, Dave Carlson, forest technician D-4, also visits this site and sees an adult on the nest.

6/24/89: no birds seen on the nest or in the area. A little whitewash is apparent under the nest but no fresh prey items are found.

7/22/89: no birds are seen in the area. I find a few spots of fresh whitewash under the nest and under a snag 300' north of nest. I search the lodgepole stand adjacent to the nest but find no other nest tree or prey items. Red squirrels respond with alarm chattering to the goshawk tapes.

10/07/89: no birds seen in area. Fresh snow on ground.

8.) Canyon Creek Unit 247/12 (D-5): on 7/28/87 an adult goshawk called and followed a crew worker in this area. A few other birds were heard calling also. A visit to this sight in early July this year revealed nothing. Later a fledged goshawk was discovered on the eastern unit boundary but the actual nest tree was never found. A few older stick nests exist within the unit. The habitat is mixed conifer with a preponderance of Douglas fir. Stands of aspen are located to the west. Large agricultural fields exist within 1/2 mile to the west also. The bird was seen on a small ridge in between two seasonal drainages.

7/01/89: no birds seen or heard in this area.

8/05/89: as I walk through the unit at 2020, a fledged goshawk starts to "kak". The bird is only 100' away. It looks large, has a buffy supercilium and pale facial disc. Its crown is striped, and dark streaks on its chest extend down to the lower belly. The undertail coverts are white with large brown spots on the sides. There are also large brown spots on the white leggings. Eye color is grayish.

The juvenile flies to a lone Douglas fir. I play the food-begging tape and it flies within 150' of me, perches, alarm-calls, and looks about. Then it flies to the southwest to a clump of fir, calling continuously. Another young bird flies off a tree as I leave the unit. The next morning, a young bird is in the same location at the northeast corner of the unit. It follows me about calling for a few minutes, then disappears to the east.

9/01/89: no goshawks in area. Three fledged great gray owls food-beg in the middle of unit.

9/28/89: no goshawks. One young agitated male moose causes observers to climb tree.

C. NEST SITE HABITAT DATA

Two different levels of nest site habitat data was collected at goshawk nest sites on the Targhee National Forest. Nest tree data was collected at 6 current and 9 historic active nest sites (Table 5) and at 7 sites assumed to be goshawk alternate nests (Table 6). (Stick nests assumed to be alternate nests were located within 1/2 mile of known active nests and of similar size and appearance to active nests.) Nest stand data was collected at 6 current active nest sites and three historic sites (Table 7). Nest stand data was also collected at three other older historic sites after these areas had already been harvested (Appendix D). This data is included for comparative purposes but is of questionable value as the small size of buffers left (.5-2 acres) resulted in greatly increased tree fall.

TABLE 5. NEST TREE DATA, ACTIVE GOSHAWK NESTS, TARGHEE NATIONAL FOREST, 1980-89.

TERRITORY:	Alex Draw	Rattlesnk	3 Mile Cr	Sheep Cr	Steel Cr	Kay Cr	Walk Fish	Fall R	Hominy Pk	Grandv N1	Grandv N3	Morris Cr	Teepee Cr	Rocky Can	Ruby Cr
YEAR ACTIVE:	83,89	83	83	87	88	89	89	89	89	81	86	80,81	85	87	86,89
DISTRICT:	(B-1)	(B-1)	(B-1)	(B-1)	(B-1)	(D-1)	(B-2)	(D-3)	(D-3)	(D-5)	(D-5)	(D-5)	(D-5)	(D-4)	(D-4)
NEST TREE:															
Species	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	ASP	LPP
Age	260	122	135				110	135	125	175					99
Height ft (m)	99(30)	80(24)	79(24)	89(27)	126(38)	73(22)	88(27)	98(30)	61(18)	95(29)	80(24)	70(21)	50(15)	60(18)	84(26)
DBH in (cm)	23.3(59)	19.1(48)	21.6(55)	20.2(51)	19.3(49)	13.5(34)	19.0(48)	22.5(57)	15.0(38)	25.6(65)	24.0(61)	14.0(36)	10.5(27)	10.6(27)	13.0(33)
Elevation ft	7260	7400	6800		6900	7500	6900	6100	6900			6550	6500	5700	7100
(m)	(2213)	(2256)	(2073)		(2104)	(2286)	(2104)	(1860)	(2104)			(1997)	(1982)	(1738)	(2165)
NEST:															
Height ft (m)	40(12)	43(13)	32(10)	45(14)	55(17)	51(16)	53(16)	70(21)	42(13)	30(9)	43(13)	40(12)	30(9)	36(11)	50(15)
Aspect	SE			SE	N	N	SE	N	center of tree	SW	SE		E	center of tree	E
SLOPE:															
Position (in thirds)	mid	flat	upper	lower	mid	lower	lower	upper	upper					lower	lower
Percent	16	10	41	39	33	34	14	30	20	8	12			15	25
Aspect	S	SW	N	N	NW	N	SE	N	N	N	N			N	NE

Nest Tree Data:

Nest tree data was collected for all active nests and suspected alternate nests found in survey areas. Table 5 summarizes all the data collected in previous years at active nest sites as well as that from 1989. Of the 15 nests measured, all but two are in Douglas fir (Pseudotsuga menziesii). Averages for 13 Douglas fir nest trees are:

tree height	83.7'	(25.5m)
DBH	19.0"	(48 cm)
nest height	44.2'	13.5m).

The average age measured for seven of these Douglas fir nest trees is 152 years.

One active nest each was found and measured in lodgepole pine (Pinus contorta) and in aspen (Populus tremuloides) trees. In the aspen, tree height is 60' (18m), dbh is 10.6' (27cm) and nest height is 36' (11m). For the lodgepole pine nest tree height is 84' (26m), dbh is 13" (33cm), nest height is 50' (15m), and tree age is 99 years.

Considering all 15 nest sites, nest placement on the tree itself occurs on all aspects but the nest trees tend to be located on north or west facing slopes. Although not indicated on the table, the majority of goshawk nests found are located just below the canopy level; a few are in the bottom portion of the canopy itself. Slopes on which nest trees are located range from 8 to 39% with an average of 23%. Nest trees are found on all sections of the slope from the upper to the lower third. Visual assessment suggests that many nest trees are located topographically to offer security from high winds, severe weather and detection.

Table 6 presents nest tree data collected at seven assumed alternate nest sites. Data for Douglas fir trees is slightly lower but similar to that for active nests:

tree height:	80.8'	(24.6m)
DBH:	18.6"	(47cm)
nest height:	40.2'	(12.2m)

Data for the aspen alternative nest at Rocky Canyon is also very close to that measured at the active nest site. Tree height is 62' (19m), dbh is 11.9 (30cm), and nest height is 40' (12m).

Percent slope for all species ranged from 0 to 34 with an average of 14.5%. Five of the seven sites sloped toward the west. Five of the seven alternate nests were found on the southern side of the tree.

TABLE 6. NEST TREE DATA, ASSUMED ALTERNATE GOSHAWK NEST SITES, LOCATED IN 1989, TARGHEE NATIONAL FOREST.

TERRITORY:	Kay Cr	Sheep Cr #1	Sheep Cr #2	Sheep Cr #3	Fritz Cr	Walk Fish	Rocky Can
DISTRICT:	(D-1)	(D-1)	(D-1)	(D-1)	(D-1)	(D-2)	(D-4)
NEST TREE:							
Species	DF	DF	DF	DF	DF	DF	ASP
Age						180	
Height ft (m)	65(20)	80(24)	83(25)	82(25)	67(20)	108(33)	62(19)
DBH in (cm)	14.0(36)	20.5(52)	16.0(41)	19.6(50)	15.4(39)	26.0(66)	11.9(30)
Elevation ft (m)	7500 (2286)				7600 (2317)	6900 (2104)	5700 (1738)
NEST:							
Height ft (m)	54(16)	38(12)	38(12)	23(7)	28(8)	60(18)	40(12)
Aspect	center of tree	SE	SW	SW	SW	S	center of tree
SLOPE:							
Position (in thirds)	lower	lower	lower	lower	upper	flat	lower
Percent	34	11	2	13	27	0	5
Aspect	W	W	W	SW	NE	SE	NW

Nest Stand Data:

Nest stand data was collected at six 1989 active nest sites. Table 7 presents this data along with data previously collected at three historic sites. For six of the nine stands, Douglas fir is the predominant tree species, ranging from 84% to 100% of all trees with DBH greater or equal to 5 inches. Two of these stands are composed solely of Douglas fir. The other four show some mix of lodgepole and subalpine fir. Two stands out of nine are predominately lodgepole pine and one stand is aspen. It should be noted that at Hominy Peak (D-3) even though the stand is composed of 92% lodgepole pine, the goshawk nest itself is located in a Douglas fir.

For the Douglas fir stands, average density for all tree species over five inches is 194. The mean dbh for Douglas fir trees in these stands is 13.0" (33cm), density of snags is 43 per acre, and estimated canopy cover is 77.5%.

The nest stands located in lodgepole pine have a much higher tree density over 5" DBH, 318, but canopy cover is similar at 80%. Average number of snags per acre is also much higher at 132.

For the one aspen site, density of trees/acre greater than 5" (184), number of snags per acre (6), and canopy cover (65%) are less than that found in the Douglas fir stands. The aspen stand has the highest number of seedlings of all measured stands, however.

Considering all stands measured, the distance to a permanent water source ranged from 115' (35m) to 6336' (1932m), averaging 1879' or 573 meters. Although not measured, it did appear that many sites were located closely to an intermittent or seasonal water source that would provide potential bathing, drinking, and foraging locations during the early part of the nesting season.

Assumed alternate nests were located at four of the nine active stands, ranging from 18' (5m) to 4000' (1220m) distance from the active nest tree with an average of 1530' or 466 meters. At sites where no alternative nests were found, it was thought that they could be located at greater distances than that searched. At other historic territories, Sheep Creek (D-1) and Long Gulch (D-4) (not measured), alternate nests were found spaced between 100-200' along the base of ridges on the same elevation contours as the original nest. At Rocky Canyon (D-4), an assumed alternate nest was located in an adjacent drainage above the Snake River at approximately the same elevation and position within the drainage as the active nest had been found.

Understory species for seven of the active goshawk nest stands are presented in Table 8. This table indicates presence of major species rather than estimates of understory types. All

TABLE 7. NEST STAND DATA, ACTIVE GOSHAWK NEST SITES, TARGHEE NF, 1980-1989

TERRITORY:	Alex Draw 83,89	Kay Cr. 89	Walk Fish 89	Fall R 89	MA 12 89	Ruby Cr 86,89	Rocky Can 86	Morris Cr 80,81	Teepee Cr 85
District:	(D-1)	(D-1)	(D-2)	(D-3)	(D-3)	(D-4)	(D-4)	(D-5)	(D-5)
A. *Dominant Tree Species:	DF	DF	DF	DF	LPP	LPP	ASP	DF	DF
B. *Nest Tree Species:	DF	DF	DF	DF	DF	LPP	ASP	DF	DF
C. Trees > 5" DBH									
Density all species: (#trees/acre)	134	197	130	274	413	223	184	189	242
Density DF: (% total)	134 (100)	172 (87)	118 (90)	274 (100)	32 (8)		48 (26)	161 (85)	204 (84)
Density LPP: (% total)		22 (11)	13 (10)		382 (92)	223 (100)	22 (12)	22 (12)	26 (11)
Mean DF DBH inches (cm):	16.0(41)	12.7(32)	13.6(34)	12.2(31)	9.9(25)		7.8(20)	10.9(28)	12.5(32)
E. Density all trees 3-5" DBH:	6		41	13	127	146	54	10	13
F. Density all trees 1-3" DBH:	few	150a	140	few	102	many	512		
G. Density snags/acre:	38	35	48	10	150	115	6	39	89
H. Mean DBH snags inches (cm):	6.1(15)	10.6(27)	6.1(15)	11.8(30)	4.9(12)	7.6(19)	10.7(27)	9.4(24)	10.6(27)
I. Old-growth parameters:									
a. Density trees > 20"DBH:	31.8	0	28.6	19.1	0	0	0	3.2	0
b. Density snags >12"DBH:	3.2	15.9	0	3.2	0	9.5	0	3.2	6.4
J. Estimated % Canopy Cover:	80	70	70	90	90	70	65		
K. Distance to water feet (m):	400(122)	1500(457)	115(35)	2000(610)	6336(1932)	1000(305)	1800(549)		
L. Distance to alternate nest in feet(m):		18(5)	100(30)	4000(1220)			2000(610)		

Footnotes: *Tree species code: DF Douglas Fir
LPP Lodgepole Pine
ASP Aspen

TABLE 8. UNDERSTORY PLANT SPECIES, ACTIVE GOSHAWK NEST SITES, TARGHEE NATIONAL FOREST

TERRITORY:	Alex Draw	Steel Cr.	Kay Cr.	W.Fish	Fall R.R.	Hominy Pk	Eccles Rd	Ruby Cr.	Rocky Can.	Grandv #1	Grandv #3
DISTRICT:	(D-1)	(D-1)	(D-1)	(D-2)	(D-3)	(D-3)	(D-3)	(D-4)	(D-4)	(D-5)	(D-5)
Plant Species:											
Amelanchiur alnifolia									x	x	
Arnica, sp.	x		x								
Berberis repens		x	x	x					x		
Clematis,sp											x
Fragaria, sp.			x				x				
Juniperus communis									x		
Lonicera, sp.			x		x	x				x	x
Lupinus, sp.					x				x		
Shepherdia canadensis											x
Sorbus scopulina			x			x					
Spirea betulifolia			x		x					x	x
Symphoricarpos, sp.			x	x	x						
Vaccinium. sp.						x	x	x	x		
Grasses	x	x	x	x	x	x	x	x	x	x	x

sites had a fairly sparse understory allowing for easy flight at low levels through the stand.

D. PREY REMAINS AND PELLETS

A list of common prey items of the goshawk can be found in Appendix E (Jones, 1979). A number of feathers, bones, pellets and carcasses were found at nest sites. Arrangements to have these pellets analyzed at a local university are being made. The following prey remains were identified at different sites throughout the forest:

Snowshoe Hare	Lepus americanus
Unita ground squirrel	Spermophilus armatus
Chipmunk, sp.	Tamias, sp.
Red squirrel	Tamiasciuris hudsonicus
Ruffed grouse	Bonasa umbellus
Mallard	Anas platyrynchos
Gray Jay	Perisoreus canadensis
Steller's Jay	Cyanocitta stelleri
Clark's Nutcracker	Nucifraga columbiana
American Robin	Turdus migratorius
Yellow-rumped Warbler	Dendroica coronata
Dark-eyed Junco	Junco hyemalis

The most common live prey species seen at every nest site was the red squirrel whose nests and middens were often found very close to goshawk nest trees. David Acthaud, biological technician, observed a goshawk grab a red squirrel from a Doug fir near the Fall River Ridge nest (D-3) in July, 1989. Squirrels would often respond with a scolding chatter to taped goshawk calls. A study of goshawks in northern California found that the squirrel family (Sciuridae) made up 55% of the total diet, accounting for 59% of total biomass (Woodbridge, 1987).

Gray jays and robins would also respond strongly to the goshawk tape, often coming in to scold and investigate the call. On a few occasions, gray jays would imitate the goshawk alarm call so well that it was assumed a goshawk was in the area. The number of grouse prey remains found near nest sites suggests that this bird also is a significant local prey item for the goshawk.

One of the most interesting observations of goshawk predation attempts occurred by chance on 24 April 1989 near Moose Creek on the Teton Basin District about 1/4 mile outside the forest boundary. An adult goshawk flew into a large sagebrush located in a grass and sage covered meadow, and perched well concealed just a foot off the ground. The many ground squirrels in the area chirped in alarm and stayed close to their burrow entrances. The goshawk then flew into the open, landed on the grass and proceeded to run on foot from hole to hole. No prey capture was observed.

Ground squirrels may be an important item in the goshawk's diet early in the season before many of the local breeding bird have returned to their territories. Shuster (1980) reported ground squirrels to be a preferred prey item of goshawks in montainous areas of Colorado and thought goshawk populations were highest near forest openings with dense populations of ground squirrels.

IV. DISCUSSION:

A. Goshawk Nesting Chronology, Targhee NF

The nesting chronology of goshawks found on the Targhee NF appears similar to that reported elsewhere in the west (Reynolds,1983). In 1989, all observed young goshawks fledged by July 20. Birds, thus, begin nest building in March, lay eggs in April or May, eggs hatch approximately 30-32 days later in mid to late June, and birds fledge about 36 days later, sometime in July to early August. Young birds seem to remain very close to the nest area for 30-50 days. In September, sightings of the goshawk on the forest become very scarce.

There are few winter records on the Targhee and where the local birds winter is unknown. Concentrations of goshawks are seen every winter to the west in Idaho around Mud Lake, Camas National Wildlife Area, and other wetlands where waterfowl concentrate, but whether these are local breeders has never been determined. (J. Naderman, pers. comm.) At a bald eagle territory on the South Fork of the Snake River (D-4) located near an active goshawk nest territory, I did not see any goshawks from October until late February, 1988, although many ducks wintered in the area.

B Goshawk Nesting Habitat and Home Range

Nest stand data from the Targhee NF is similar to that measured elsewhere in the west. Goshawk nests are usually found in mature and/or old-growth stands with tall single-layered or multi-storied canopies located on gentle to moderate slopes with northerly aspects, often adjacent to quiet, ephemeral streams (Reynolds, 1989). Previous studies, summarized below, on goshawk habitat in the Rocky Mountains have been completed in Montana and northern Idaho (Hayward, 1983), southeast Idaho (Chase, 1979), Utah (Hennessey, 1978), and Colorado (Shuster, 1980).

Hayward (1983) reports in the Forest Service Northern Region that 65% of goshawk nest stands found were classified as mature and 24% old-growth (p. 7). Nests were found in western hemlock, Douglas fir and lodgepole pine trees. Hayward distinguishes between nest sites in the wet Columbian Highland

region (multi-storied stands) and in the drier Rocky Mountain Forest (even aged stands with higher tree density and smaller size classes). Nest sites characteristics included high canopy cover (80%), high basal area (120-220 square feet/acre), and north to eastern aspects with gentle to moderate slopes.

In the Caribou Range of southeast Idaho, Chase (1979) found 6 active goshawk nests in 1978 and 4 active nests in 1979 within a 20 square mile area. Eighty two percent of all active and inactive goshawk nests found were in aspen; the remaining nests were in Douglas fir and subalpine fir. Nests were located an average 315' (96m) from water and at elevations between 6600 and 7300' (2012-2226m) on north facing slopes.

Hennessey (1978) located 32 active goshawk nest sites during 1973-74 on the Cache National Forest of Utah and Idaho. Nests were found in aspen (61%), fir (21%), lodgepole (11%), and spruce and cottonwood (4% each). Average elevation was 6773' (2065m), average distance to water 1292' (394m), and locations tended to be on lower parts of north facing slopes with well-developed tree canopies. He reported goshawks to be more sensitive to man than either the Cooper's or sharp-shinned hawks, nesting at a farther distance from human disturbance

Shuster's study (1980) in the Arapaho and Roosevelt National Forests and Rocky Mountain National Park describes 20 active goshawk nest sites found between 1971 and 1977. Nest trees used were aspen (50%), ponderosa pine (25%) and lodgepole pine (25%). Average height of nest trees was 63' (19.2m); average dbh was 9.8" (25cm). Elevations ranged from 7396 'to 8738' (2255-2664m). Slope averaged 12.5% with mostly north and east aspects. Nests were 39-49' (12-15m) above the ground in aspen and 27-39' (8.5-12m) in pine. Nest stands had sparse understory and were located an average of 900' (275m) from water. Although many nest were found in drainages, Shuster notes that none were located near cataracts or fast flowing, noisy streams.

Old-growth stands on the Targhee National Forest are described in the Land Resource Management Plan (LMP, p. 673), and in the Timber-Wildlife Coordination Guidelines (Johnson, p.2). In the LMP, old-growth is defined as multi-storied Douglas fir and mixed conifer stands having two or more well developed canopies. There should be at least 15 over-story trees per acre 140-240 years old of 16 inches or greater dbh. Canopy closure should be 50-70%; there should be at least 2.4 snags per acre greater or equal to 12 inches dbh. Large diameter downed woody material should be a component on the forest floor. Size of stands should be 100 to 300 acres. Johnson states in addition that down and dead material should comprise 10% of total biomass, 15 Douglas fir per acre should exceed 21" dbh and 1-2 Douglas fir snags per acre should exceed 21" dbh.

Referring back to Table 7 "Nest Stand Data" (p. 20), Ale Draw (D-1) is the only active current goshawk nest site of those

measured that meets most of the old-growth criteria: average Douglas Fir dbh of 16", density of trees greater than 20" dbh is 31.8/acre, density of snags greater than 12" is 3.21/acre, and canopy cover is 80%. The other Douglas fir nest stands inventoried are mature forest stands with varying degrees of old-growth characteristics.

Although most of the Targhee nest locations found to date have been in Douglas fir stands, this may be due to timber inventory logistics. Timber crews marking Douglas fir sale units need to observe almost every tree within a unit in order to select those for harvest. Lodgepole pine units slated to be clercut are generally marked only on their boundaries greatly lessening the chances that hawk nests will be discovered. Nesting records from Ruby Creek (D-4) in the Big Hole Mountains. and from Antelope Road and Eccles Road (D-3) in the Caldera region suggest that goshawks do use older lodgepole stands on the Targhee for nesting. Rocky Canyon (D-4) is the only existing aspen nest site record for the forest. Data from other areas in the Rocky Mountains referred to previously suggests that more nest sites in aspen and lodgepole could be expected on the forest. Two informal records of local goshawks nesting in cottonwood trees have also been reported (Mike Delate, pers. comm.).

Within goshawk nesting territories and home ranges, alternate nests are often found. Reynolds (1983) reported that alternate nests are usually located within 300 ft (100m) of older nests and that goshawks show great fidelity to the same nests for many years. More recent work suggests that alternate nests are often located at much greater distances. In Arizona, goshawks never used the same nests in consecutive years but appeared to alternate every other year between two nests within 0.6 mile (1 km) of each other. Some territories had up to four different nests (Crocker-Bedford and Chaney, 1988). In northern California, in a study of 49 territories, 82% of the goshawks relocated each year moving an average of 777' (237 m) from the previous nest tree. This is approximately the radius of a 50 acre circle. A quarter of the pairs moved up to 1.7 miles (2800 m) (Woodbridge, 1989).

Suspected alternate goshawk nests on the Targhee NF have been found at distances from 18' (5.5 m) to over 3/4 mile (1207 m) from known active nests. The most nests found in any territory has been four at Sheep Creek (D-1). At those territories where no alternate nests have been found, such nests may have been missed or located at greater distances than areas searched. Because goshawks often use alternate nests, it should never be assumed a particular territory is unoccupied because a nest site remains vacant for a year or more.

No data on goshawk home range size exists for the Targhee Forest. In a radio telemetry study in New Mexico, the average home range was 13.4 square kilometers or 5.2 square miles

(Kennedy, 1985). Older studies based on visual observations reported home range sizes from .8 square miles in Wyoming (Craighead and Craighead, 1956) up to 9.5 square miles in Oregon (Reynolds, 1979) Distances between nest clusters or territories has been estimated at 3.5 mi in Oregon (Reynolds, 1983), 1.6 miles in Arizona (Crocker-Bedford, 1983), 2.2 miles in New Mexico (Kennedy, 1985), 3.7 miles in California (McCarthy, 1986), and 6-8 miles in the Northern Rockies (Reynolds, pers. comm.). The greatest concentration of goshawks located so far on the Targhee has been in the Centennial Mountains (D-1). There some active nest territories may exist within 1.5 to 2 miles of each other.

C. Active Goshawk Nesting Territories 1980-1989, Targhee NF

Table 9 presents a summary of all known active and probable goshawk nesting sites on the Targhee National Forest from 1980-89. All historic records were reviewed and classified after the 1989 field season. Experience gained in 1989 suggested that any report from a reliable observer of defensive goshawk adults in June or July, or of food-begging young in July or August could be rated as an "active" site even if no actual nest tree was located. (If a nest should fail as at Ruby Creek in 1989, the adult birds seem to become very quiet and difficult to locate.) "Probable" nest territories include unconfirmed sightings of defensive adults, or sightings of immature goshawks later in the season who may have moved an unknown distance from the actual nest area. Table 9 describes the observation used in each case to classify a record. It also indicates what management activities, if any, have occurred at each site.

A total of 27 active nest sites have been located on the Targhee NF, thought to represent 24 distinct territories. Eight of these territories are located on D-1, seven on D-5, five on D-3, three on D-4, and one on D-2. Table 10 presents a break-down of what years active nests were found and subsequently checked between 1980-1989. It also indicates which sites have been disturbed by management activities and if such activities were thought to result in loss or possible loss of that site for breeding goshawks. Of the 27 nest sites, reuse of specific sites has been recorded six times. Unfortunately, not enough of the nests have been rechecked regularly or adequate searches been made for alternate nests to be able to summarize occupancy trends. Goshawks may use the same nest again or occupy alternate nests within their territory, so absence of a breeding pair at a specific site does not necessarily indicate territory failure for that year.

Of the 27 active sites, a total of 16 (59%) have experienced some form of short or long term disturbance from human activity or habitat alteration. Eleven of these have been rated as "lost" for future breeding sites, and three as "possible losses". Two of the disturbed sites, Alex Draw (D-1) and Ruby Creek (D-4),

TABLE 9. GOSHAWK ACTIVE NEST SITES, TARGHEE NATIONAL FOREST, 1980-89

#	DISTRICT	LOCATION	MA	TSR#	ACTIVE	OBSERVATION	MANAGEMENT ACTIVITY
1.	D-1	Alex Draw TS	4		1983	1 nestling	unit cut 1987; buffer left
					1989	3 fledged	slash and pile
2.	D-1	South Three Mile Creek	4		1983	feathers/whitewash	to be cut; buffer?
3.	D-1	East Rattlenake Salvage Sale	4		1983	pair-nest defense	to be cut; buffer?
4.	D-1	South Fork Deep Creek	3		1984	adult vocalizing-July	none
5.	D-1	Sheep Creek Elk Transect	4		1985	pair-nest defense	none
6.	D-1	East Steel Creek TS	4		1988	3 young in nest	unit cut 1989;buffer left
7.	D-1	Fritz Creek	3		1988	16 June adult calling	proposed wilderness area
					1989	2 fledged	
8.	D-1	Kay Creek Timber Sale	4		1989	3 fledged	to be cut; buffer left
9.	D-2	Walking Fish TS	4		1989	1 fledged	to be cut; buffer left
10.	D-3	N. Antelope	10		1981	A. Franklin reported	area cut; buffer left
11.	D-3	Anderson Mill TS	10		1981	A. Franklin reported	old cut area
12.	D-3	Eccles Rd. Unit	10		1985	2 adults/nest	unit cut; buffer left
13.	D-3	Fall River Ridge	12		1989	3 fledged	aspen management area
14.	D-3	MA 12 Sale Area (Hominy Peak)	12		1989	1 fledged	unit deleted
15.	D-4	Water Canyon	19		1984	young/nest	area burned 1987
16.	D-4	Argument R. Sale (Ruby Creek)	16		1986	1 young in nest	unit deleted
					1989	nest incubation; failed	
17.	D-4	Rocky Canyon	17		1986	adult-nest defense	none
					1988	adult/1 fledge/no nest	
18.	D-5	Dry Cr. TS DN 24 (Morris Cr.)	15		1980	2 young in nest	unit cut; buffer lost
					1981	2 fledged	
19.	D-5	Grandview TS Nest #1	16		1981	adults/nest/whitewash	unit cut; 2 acre buffer
19a.	D-5	Grandview TS Nest #2	16		1982	adults/nest/pellets	tree blown down 1986
19b.	D-5	Grandview TS Nest #3	16		1986	3 young in nest	unit cut; buffer?
20.	D-5	Dry Cr.II (Teepee Cr)	15		1985	1 young in nest	unit cut;buffer left
20a.	D-5	Teepee Creek Road 807	15		1987	1 adult calling July	area cut
21.	D-5	Canyon Cr. TS	16		1986	adult defensive;vocal	unit cut 1989
22.	D-5	Canyon Cr. TS (Kirkham Hollow)	16		1987	adult defensive	to be cut 1990
					1989	1 fledged, no nest	
23.	D-5	Pole Canyon Unit 18	15		1987	2 adults; 3 young	area cut
24.	D-5	Kirkham Hollow TS (Graham Spring)	16		1988	pair defensive	unit cut 1989

OTHER PROBABLE NEST SITES (NEED FURTHER CONFIRMATION):

1.	D-1	Pete Creek Road 010	4		1989	adult accipiter calling	
2.	D-4	Long Gulch Sale Area	17		1984	nest/whitewash/feathers	sale cancelled
					1989	3 nests/grouse feathers	
3.	D-5	Green Lake	15		1989	1 immat goshawk 8/31	wilderness
4.	D-5	Packsaddle headwaters	16		1989	1 immat goshawk 9/14	sale area?

#complete table on file at district offices

TABLE 10. GOSHAWK NEST SITE YEARLY MONITORING SUMMARY, TARGHEE NF, 1980-1989

#	DISTRICT	LOCATION	YEARLY NEST CHECKSa: 1980a	1981	1982	1983	1984	1985	1986	1987	1988	1989	SITE DISTURBEDb	SITE LOSTc
1.	D-1	Alex Draw TS Unit 17A				A	x	x			x	A	TS	no
2.	D-1	South Three Mile Creek				A	x	x			x	x	TBC	possible
3.	D-1	East Rattlenake Salvage Sale				A	x	x			x	x	TBC	possible
4.	D-1	South Fork Deep Creek					A	x				x	no	no
5.	D-1	Sheep Creek Elk Transect						A		P	x	x	no	no
6.	D-1	East Steel Creek TS Unit F									A	x	TS	possible
7.	D-1	Fritz Creek									A	A	no	no
8.	D-1	Kay Creek Timber Sale Unit 21										A	TBC	possible
9.	D-2	Walking Fish TS Unit 9										A	TBC	possible
10.	D-3	N. Antelope		A	x	x	x	x	x	x	x		TS	yes
11.	D-3	Anderson Mill TS		A							x		old TS	possible
12.	D-3	Eccles Rd. Unit 104-10						A	x	x	x		TS	yes
13.	D-3	Fall River Ridge										A	no	no
14.	D-3	MA 12 Sale Area Unit 326-11 (Hominy Peak)										A	no	possible
15.	D-4	Water Canyon					A	x	x	D			burn	yes
16.	D-4	Argument R. Sale Unit 17 (Ruby Creek)							A		x	A	road	no
17.	D-4	Rocky Canyon							A		P	x	no	no
18.	D-5	Dry Cr. TS DN 24 (Morris Cr.)	A	A	x	P		x	D				TS	yes
19.	D-5	Grandview TS Nest #1		A	x	x			x	x	x		TS	yes
19a.	D-5	Grandview TS Nest #2			A	x			D	(tree cut)			TS	yes
19b.	D-5	Grandview TS Nest #3							A	x	x		TS	yes
20.	D-5	Dry Cr.II Unit 20 (Teepee Cr)						A			x	x	TS	yes
20a.	D-5	Teepee Creek Road 807								A	x	x	TS	yes
21.	D-5	Canyon Cr. TS Unit 245/20							A	x		x	TS	possible
22.	D-5	Canyon Cr. TS Unit 247/12 (Kirkham Hollow)								A	x	A	TBC	possible
23.	D-5	Pole Canyon Unit 18								A	x	x	TS	yes
24.	D-5	Kirkham Hollow TS Unit 246/17 (Graham Spring)									A	D	TS	yes

KEYS:

a. Yearly Nest Checks:
- A active nest site; adults and/or young observed
- P probable active nest site; adult seen or heard once
- x site checked between June-August
- D nest tree destroyed

b. Site Disturbed:
- TS timber sale occurred in area
- TBC timber sale to be cut
- no no human activities at site

c. Site Lost:
- no nest site in good condition
- yes nest site unsuitable for goshawks
- possible nest site condition disturbed or to be disturbed; effects unknown

have been reused by nesting goshawks.

Another six (22%) of the 27 total sites are in areas scheduled for future timber harvest activities. They also are listed as "possible losses". Included in this group are two timber units not yet sold: Walking Fish (D-2) and Hominy Peak (D-3). Hominy Peak is included even though the sales unit where the nest site is located has been deleted from the sale. It is unknown what future habitat alteration will occur near this area. Four of these six are in sale units that have already been sold: South Three Mile Creek (D-1), East Rattlesnake (D-1), Kay Creek (D-1), and Kirkham Hollow (D-5).

Only five sites (18%) out of the total 27 are located in areas that have remained relatively undisturbed with no future management activities planned: S. Fork Deep Creek (D-1), Sheep Creek (D-1), Fritz Creek (D-1), Fall River Ridge (D-3), and Rocky Canyon (D-4).

All sites which have been rated as "lost" except for Water Canyon (D-4) which was burned out by a natural occurring fire are in areas of extensive clear-cuts: N. Antelope (D-3), Eccles Rd. (D-3), Morris Creek (D-5), Grandview (D-5), Teepee Creek (D-5), Pole Canyon (D-5), and Graham Spring (D-5). Even in cases where small buffers had been left around the nest tree, there does not appear to be suitable canopy cover left to provide adequate nesting habitat in these areas. Nor does it appear that enough good habitat remains in such areas for alternate nests to exist.

At the three disturbed sites rated as "possible losses", future data is needed to evaluate overall impacts to these areas. Two of these sites were harvested only this summer: Canyon Creek 245/20 (D-5) and E. Steel Creek (D-1). At Anderson Mill (D-3), timber harvesting occurred in the area before a goshawk nest site was found in 1981. This area needs to be surveyed to determine possible goshawk use.

All five sites listed as TBC (timber sale to be cut) in Table 10 and rated as "possible losses" are in Douglas fir selective cut units: South Three Mile Creek, East Rattlesnake, Kay Creek (D-1), Walking Fish (D-2), and Canyon Creek (D-5). This type of harvesting may be less detrimental than clear-cutting to the goshawk if adequate buffer zones are left around the nest tree. Proof of this exists at Alex Draw, a Douglas fir shelterwood cut harvested in 1987, where three young goshawks fledged in 1989 from the same nest tree last used in 1983. An important feature of the buffer left there seems to be that it did not create an "island" of uncut trees but connects to a large uncut area of forest. This area also is located behind a locked gate so, besides for timber harvest activities, very little human disturbance occurs.

The other disturbed site which goshawks subsequently used is at Ruby Creek (D-4). The nest was found during road building

activities; later, this unit was deleted from the sales area so the road remains undeveloped and closed to public use.

To summarize, out of 27 known active goshawk nests, a total of seven (26%) are in areas that should continue to be viable for goshawk breeding pairs, nine (33%) may possibly be lost, and eleven (41%) are believed lost for future use due to habitat alteration. It should be noted that most nest sites have been located in conjunction with timber harvest activities. There are significant areas of the forest without timber harvest activities scheduled that have not been surveyed so the overall status of the goshawk on the forest has not been determined.

D. Management of the Goshawk

In the Targhee NF Land Management Plan (p. 159) and the Timber-Wildlife Coordination Guidelines (Forest Service Manual 2630.3), the following direction is stated to prevent disturbance to nesting raptors and to maintain their nesting habitat:

1. Prohibiting logging, road construction, and other major disturbance activities within one quarter mile of known accipiter nests from April through June 15.

2. Managing a 10-acre buffer around accipiter and buteo nests in which the character of the stand is maintained; management activities could occur after June 15, but preferably should be postponed until August.

3. Maintaining a forested environment adjacent to at least portions of the buffer areas of accipiter nests; accipiters many discontinue using a nest location if hunting habitat is lacking in the surrounding vicinity.

In the past, most goshawk nests have been found in timber sale units during timber harvest activities and only very small buffers (1-2 acres) if any have been left. As suggested previously, even if the required 10 acres are left, if the buffer does not connect to some continuous uncut forest and if inadequate foraging habitat remains outside the buffer, the territory will probably be lost.

Recent research suggests that 10 acres provide too small a buffer to protect a nest site. Reynolds states in a Forest Service technical publication on accipiter managment:

> If an accipiter nest is found in an area to be harvested, the entire nesting stand should be maintained. Protected areas about accipiter nests should include portions of the stand upslope from the nest containing the plucking and roost sites, the nest, and some portion of the stream (if one is present).

> The shape of uncut areas will be determined partly by the topography; they should be round or oblong in flat areas, and broad-based triangular or sectorial in steep terrain with the bisecting radius beginning below the nest and running up slope through the nest tree. Nest sites should not be isolated by silvicultural treatments (clearcutting, commercial thinning). (Reynold, 1983, p. 6)

He recommends leaving an uncut area of 8 ha or 20 acres around active goshawk nests. Other research suggests, however, that even 20 acres will not provide enough habitat to maintain the nest site.

Bloom (1986) reports that in California in 1981-1983, National Forests were leaving between 25-80 acre buffer zones around goshawk nests. He recommends as a "preliminary minimum estimate", however, that at least 50 ha or 125 acres be left as a nest stand buffer which includes key foraging areas such as streams, meadows, and aspen groves. He notes that "this still places territories at risk and only selective cutting should be permitted adjacent to this area." Telemetry studies are needed, as he notes, on goshawk home range size and territory use to determine habitat needs for this species.

Woodbridge (1988) conducted a color banding study of goshawks in the Klamath and Shasta-Trinity National Forests in northern California between 1983 and 1987. He reports that in timber management areas with several small uncut stands (30-60 acres), goshawks often moved from stand to stand and finally deserted these areas. Areas with two or more larger stands (80-120 acres) maintained nesting pairs.

Crocker-Bedford and Chaney (1988) studied goshawk occupancy rates of different size buffer zone on the Kaibab National Forest in Arizona. Buffers ranged in size from 2.5-500 acres. Comparing control and buffer territories of all sizes, occupancy rate over 3 seasons was 30% for control nest sites and only 6% for the buffered sites of all sizes in logged locales. Goshawks would sometimes reoccupy a buffered nest for one or two years and then abandon it. The general sales areas around the buffered nests totalled 36,000 acres. Half of the standing timber volume was harvested in the typical stand. Goshawk nest losses were attributed to increased predation by great horned owls (Bubo virginianus) and red-tailed hawks (Buteo jamaicensis), and to decreases in the prey base (tree squirrels and forest birds).

V. CONCLUSIONS

A. The Use of the Goshawk as a Management Indicator Species (MIS)

On the Targhee NF, the goshawk is designated as a MIS for old growth and mature mixed conifer forest habitat. As the nest stand data showed, goshawk nests located to date on the Targhee NF are found predominately in mature Douglas fir forest stands with a few also located in aspen and lodgepole pine stands.

The use of vertebrate species as ecological indicators for different habitat types and/or communities of other species has recently received much critical attention. Many biologists are uncomfortable with the concept:

> The implicit assumption in this use of indicators are that they provide a reliable assessment of habitat quality and that if the habitat is maintained for the indicator, conditions will be suitable for other species... These assumptions fail on conceptual and empirical grounds.
>
> (Landres, et al, 1988)

Within the Forest Service as well, a movement away from using animal species to indicate the quality and health of habitat types is apparently taking place. It is thought that habitats such as old growth need to be defined and measured rather than depend upon the measurement of an individual species which often is more difficult to monitor than the habitat itself. (Winifred Sidle, pers comm) Inventories of old growth Douglas fir stands are presently being conducted on the Targhee National Forest by district biologists.

The use of the goshawk as an indicator species with special habitat needs that may be influenced significantly by management programs seems to be a more appropriate and valid use than as an ecological indicator of old growth. Indeed, because of its status as a national indicator species with special habitat needs for old growth and mature forests it may be a required indicator species on those forest where it occurs (Sidle, and Suring, 1986, p 3). Data from the Targhee suggests that timber harvest activities are influencing breeding habitat for the goshawk in this area and that additional monitoring is needed to determine overall impacts on the resident breeding population.

B. Goshawk Monitoring Program, Targhee NF 1989

In 1989 more active goshawk nest sites were located on the Targhee NF than had been found in any year since goshawk monitoring begin a decade ago. The main reasons for this success included:

1.) training summer field personnel how to recognize and report goshawk sightings and following up on all current sightings.

2.) having an experienced bird observer surveying potential breeding habitats during the goshawk's most active and vocal period of the breeding season

3.) using a recorded tape of goshawk calls to flush out birds. (The tape proved most successful in locating birds that had been previously sighted in known areas. Most new nests were found by hearing adults or young vocalize between late June and mid-August.)

4.) searching through older observation records to determine potential existing breeding sites.

Suggestions for future monitoring efforts would be:

1.) to continue training summer field workers to identify goshawks and develop an incentive system to keep motivation high

2.) monitor priority areas during the nesting season from late June to early August when the goshawks are most vocal and easy to locate

3.) continue to recheck former nest sites annually, and check all identified potential nest sites.

4.) schedule aerial surveys (or possibly snow mobile trips) in aspen stands in early spring to locate potential goshawk nests before the overstory canopy develops.

5.) Monitor active nest sites in undisturbed areas as well as at disturbed locations where buffers have been left over the next few years to gain a better understanding of local goshawk habitat use and needs. In the future, different size and shape experimental buffers could also be designed around active nest sites in timber sale areas to further explore goshawk habitat requirements.

From data gathered so far, the most commonly used goshawk habitat on the Targhee Forest appears to be mature and old-growth Douglas fir forests. With a continuing active timber harvest, it is important to understand how to preserve active goshawk nests in such habitat and to determine also the success of the goshawk in other areas of the forest. Future surveys are needed

throughout the forest especially where individual birds have been sighted but no nests found. Monitoring a raptor like the goshawk which has relatively low population numbers and a secretive nature will require an accumulation of data gathered over several years before a more accurate understanding of its distribution and relative population numbers on the forest can be gained.

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APPENDIX A

Distribution Map of the Goshawk (Jones, 1979)

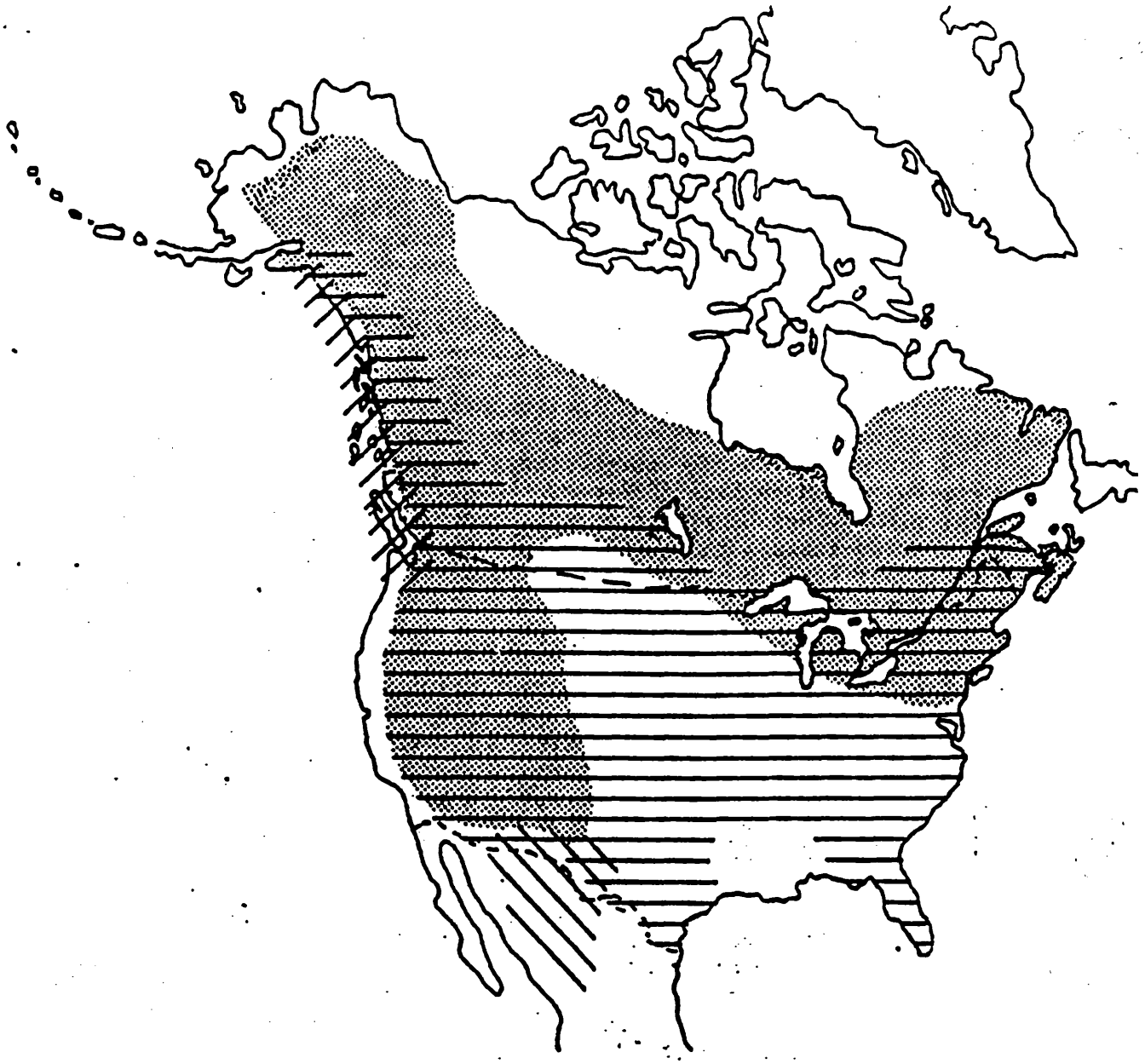
A. g. atricapillus -- Breeding Range
A. g. atricapillus -- Wintering Range
A. g. laingi -- Breeding and probable Wintering Range
A. g. apache -- Breeding and probable Wintering Range

Figure 1. Distribution of the Goshawk (Accipiter gentilis spp.) in North America.

APPENDIX B

Goshawk Monitoring Contract, Sept. 1988
Targhee National Forest

NTRODUCTION

The northern goshawk (Accipiter gentilis atricapillus) is listed as an indicator species of mature and old growth forest habitat by the Forest. Goshawk nests found on the Targhee National Forest are within aspen, lodgepole pine and primarily Douglas-fir. When located in coniferous forest the character of the stands reflects what is referred to as mature and old-growth forest. Stands used by goshawks show these characteristics, though not exclusively, large DBH (range of 17-24 inches), canopy coverage of greater than 50%, average tree ages of 120-250 years and open, park-like understory.

In the past, the goshawk was presented as a species closely tied to specific nest site parameters. Some of the current thought, in view of the variety of nest sites used, is that the goshawk may have more specific requirements relative to prey availability and quantity rather than actual nest sites. Most of the known goshawk territories have been found during layout or reconnaissance of timber sales, periods of intensive human activity. Ultimately, the thrust of our monitoring effort will be directed at assessing the relationship between the stability of our Forest goshawk populations and our resource managment activities.

There are at least two phases to monitoring of any species, first is the monitoring of population numbers, and second, the assessment of cause and effect. This plan addresses a portion of phase one which is to recheck known nest sites which have previously been identified. There are 15 well identified territories on the Targhee which will be the focus of this monitoring effort. The remaining information on the Forest is incidental sightings of individual birds, or extremely sketchy information of potential raptor nests.

Goshawk Territories

These are the territories where sufficient information and probability exists to warrant monitoring for their use.

M.A.	Location (District)		
4	East Rattlesnake	T13N R37E Sec 35,	Dubois
4	S. of Three Mile	T12N R37E Sec 9	Dubois
4	Alex Draw	T13N R37E Sec 15	Dubois
3	S.Fk. Deep Cr.	T11N R32E Sec 11	Dubois
4	Pete Creek	T14N R37E Comp 220, 8/9	Dubois
4	Sheep Creek	T13N R36E Sec 36	Dubois
10	Road 112	T11N R43E Sec 34	Ashton
10	Road 724	T11N R43E Sec 5	Ashton
17	Dry/Rocky Creek	T3N R43e Sec 32	Palisades
17	Long Creek	T1N R44E Sec 31	Palisades
16	Ruby Creek	T4N R43E Sec 18	Palisades
15	Tepee Creek	T7N R45E Sec 12	Teton Basin
16	Grandview	T6N R43E Sec 26	Teton Basin
16	Kirkham Hollow	T7N R45E Sec 11	Teton Basin
15	Pole Canyon	T7N R45E Sec 23	Teton Basin

METHODS

Known nests will be checked on the ground by the monitor. Since goshawks utilize alternate nests an area of 1/4 mile radius will be checked for all possible nests. Taped vocalizations of goshawks will be used to elicit responses while traversing territories if a nest is not identified. Two different types of calls can effectively work depending on the time of the survey. The adult alarm call is most effectively used early in the nesting season (April-May) and after incubation (late May-June). After the young have fledged and through August, the begging call of immatures birds will elicit a response. This call can elicit a response into September, however the immatures disperse further from the nest as fall approaches and this technique loses its effectiveness. In addition to the use of calls ground surveys will look for cues such as prey remains, molted feathers, white wash and butcher blocks (areas where goshawk clean their prey).

COST of MONITORING

An averagee of three days (including travel to and from the Districts) will be needed to relocate known goshawk nests. Nest searches require such time as most nest site descriptions are only known down to section. Additionally, goshawks use alternate nests from year to year.

Project cost is estimated to be $3266.80 based on this break-down.

Salary: $7.78/hr X 8 hr/day X 3 days/nest X 15 nests = $2800.80

Travel: 2330 miles to D-1, D-3, D-4 and D-5 (D-2 has no known nests) @ .20/mile = $466.00

Additional known nest territories can be monitored at the average cost of: $186.72 plus travel of about 155 miles @ .20 equaling $218.00 territory. Additional work would be paid based on actual cost of monitoring work.

RESULTS

The final outcome of this monitoring effort will be status determination of the Targhee's historic goshawk territories. The final narrative will include information on the occupancy of the territory by goshawks, description and maps identifying nest location (and alternate nests if located), available information on goshawk productivity for 1988 and a general description of stand characteristics (tree species, approximate age of timbered stand, noted prey population, ocular estimate of canopy and understory coverage. The final report will be completed by Dec.1, 1988. Copies will be sent to each District office.

APPENDIX C

Goshawk Survey Sites, 1989
Targhee National Forest

TABLE 1. Sites surveyed for goshawks, Dubois District, Targhee NF, 19

DATE	SITE	STATUS
06-07-89	E. Rattlesnake (Maj)	none
	S. Fork Rattlesnake (Maj)	none
07-05-89	Sheep Creek	inactive nest
	Alex Draw TS Unit 17A	active-3 young
07-06-89	E. Steel Creek TS Unit F	inactive nest
	Pasture Creek*	none
07-07-89	Kay Creek TS Unit 21*	active-3 young
	Cottonwood Creek*	none
07-07-89	Three-Mile Creek	inactive nest (defensive Red-tail Hawk)
07-20-89	Kay Creek TS Unit 21	3 young fledged
	Alex Draw TS	3 young fledged
	E. Rattlesnake	none
07-24-89	Pasture Creek	none
07-25-89	Pasture Creek	none
	Kay Creek TS Unit 21	3 young still in area
	Alex Draw TS, unit 17A	3 young still in area
07-26-89	Weber Creek	none
	Fritz Creek	2 fledged young
08-12-89	Kay Creek TS Unit 21	2 juveniles seen
	Sheep Creek	3 alternate nests
08-13-89	Fritz Creek	1 young calling; 1 old n
08-19-89	E. Steel Creek Unit F*, B, C	1 alternate nest
	E. Steel Creek Unit H	4 fledged Sharp-shinned Hawk
09-03-89	Pass Creek*	Cooper's & Sharp-shinned
09-04-89	S. Fork Deep Springs	none/old nest, hab. data
09-14-89	Kay Creek TS	heard calls to west/none see
10-10-89	E.Steel Creek TS Unit F	none/fresh prey remains
	Alex Draw	none/habitat data

*investigation of reported 1989 accipiter sightings

TABLE 8. Sites surveyed for goshawks, Island Park Dist.,Targhee NF 1989

DATE	SITE	STATUS
06-23-89	Road 085	none
	Sattell Peak Road*	none
06-27-89	Taylor-Carrot TS Unit 50,53,54	none/inactive nest
06-28-89	Taylor-Carrot TS Unit 49,51	none
	Stamp Meadows Rd. 052	none
07-06-89	W. Dry Creek	none
07-09-89	Green Canyon Rd.	none
08-01-89	Walking Fish TS Unit 23	none
08-02-89	Walking Fish Units 31,1,20,16, 10,25,42	none/3 inactive nests
08-03-89	Walking Fish Units 41, 9	active nest, 1 young
08-10-89	Stamp Meadows	none/Long-eared Owl
08-11-89	Taylor-Carrot TS Unit 50,51,53	none/alternate nest
08-11-89	Kick Creek Rd. 472	none
08-18-89	Blue Creek*	4 Cooper's Hawks & nest
08-19-89	Road 085/Enget Creek	3 Sharp-shinned Hawks & nest
08-29-89	Walking Fish Unit 9	none, habitat data
08-29-89	Eccles Road 112*	none
10-09-89	Walking Fish Unit 9	none, habitat data

*investigations of reported 1989 goshawk sightings

TABLE C. Sites surveyed for goshawks, Ashton District, Targhee NF, 19

DATE	SITE	STATUS
06-01-89	Boundary Pond*	none/inactive nest
	Upper Goose Lake	none
06-22-89	Thompson Hole	none
	Cave Falls	none
06-23-89	Boundary Pond	none
07-11-89	Fall River Ridge*	active nest-3 fledged
07-23-89	Fall River Ridge	3 fledges by nest
07-28-89	MA 12, Hominy Peak*	active nest-1 fledged
08-08-89	Fall River Ridge	3 fledges by nest
	MA 12, Hominy Peak	1 fledge by nest
08-24-89	Boone Creek/Fall River	none
09-02-89	Fall River Ridge	none/habitat data
10-05-89	MA 12, Hominy Peak	none/habitat data

*investigations of reported 1989 goshawk sightings

TABLE D. Sites surveyed for goshawks, Palisades Dist, Targhee NF, 198

DATE	SITE	STATUS
06-10-89	Mike Spenser	none
	Lime Kiln TS Unit 20	none
	Ruby Creek	active nest, incubating
06-15-89	Dry Canyon	inactive nest
06-24-89	Ruby Creek	none/nest deserted
07-04-89	Mike Spenser	2 old nests
07-22-89	Ruby Creek	none
	Argument Ridge TS Units 20,21	none
	Limekiln TS Units 2,18,13,20,8	inactive nest
07-31-89	Long Gulch	3 inactive nests/prey remain
08-09-89	Kelly Canyon*	2 juvenile Red-tailed Hawks
	Sheep Creek TS Units 8,12,11	none
09-29-89	Dry Canyon	alternate nest/habitat data
10-07-89	Ruby Creek	none/habitat data

*investigations of reported 1989 goshawk sightings

TABLE E. Sites surveyed for goshawks, Teton Basin Dist, Targhee NF, 19

DATE	SITE	STATUS
06-17-89	Aspen Trail/Darby Canyon	1 adult sighted Darby Canyo
06-18-89	McReynolds Resevoir	none
06-18-89	Road 383/Pole Canyon	none
07-01-89	Canyon Creek TS Unit 245/20,25	1 adult sighted 245-20
07-01-89	Units 247/9,15,12	none
07-31-89	Kirkam Hollow TS Unit 246/17,18	none, units cut
08-05-89	Canyon Creek TS Road 822 Units 245/25,21,20,22,19	none
08-05-89	Canyon Creek TS Road 816 Units 247/9,8,10,17,12	1-2 fledged goshawks 247/12
*08-15-89	McReynolds Resevoir	none
	Teepee Creek Road 807	none/fledged Great Gray Owl
08-16-89	Darby Canyon	none
08-17-89	Packsaddle TS Unit 281-28*	3 fledged Cooper's Hawks
08-22-89	Moose Creek*	3 fledged Sharp-shinned Haw
08-26-89	Milk Creek 8	none
08-28-89	S. Leigh Creek Trail 8	none
08-31-89	Green Mt. Trail*	3 fledged Cooper's Hawks 1 fledged Goshawk
09-01-89	Canyon Cr. TS Unit 247/12	none/3 fledged Great Gray
09-11-89	Fox Creek Trail 8	1 adult Cooper's Hawk
09-28-89	Canyon C. TS Unit 247/12	habitat data/no goshawk

*investigations of reported 1989 accipiter sightings

APPENDIX D

NEST STAND DATA COLLECTED AFTER TIMBER HARVESTING
HISTORIC GOSHAWK NEST SITES
TARGHEE NATIONAL FOREST

NEST STAND DATA COLLECTED AFTER TIMBER HARVEST, HISTORIC GOSHAWK NEST SITES, TARGHEE NF

TERRITORY:	Eccles Rd 85	Grandv #1 81	Grandv #3 86
District:	(D-3)	(D-5)	(D-5)
A. *Dominant Tree Species:	LPP	DF	LPP
B. *Nest Tree Species:	LPP	DF	DF
C. Trees > 5" DBH			
Density all species: (#trees/acre)	64	32	89
Density DF: (% total)		22 (70)	29 (32)
Density LPP: (% total)	64 (100)	10 (30)	60 (68)
Mean DF DBH inches (cm):		16.8(43)	14.8(38)
E. Density all trees 3-5" DBH:		19	44
F. Density all trees 1-3" DBH:	2681	150	528
G. Density snags/acre:	22	80	48
H. Mean DBH snags inches (cm):	6.5(16)	3.1(8)	4.1(10)
I. Old-growth parameters:			
a. Density trees > 20"DBH:	0	6.4	9.5
b. Density snags >12"DBH:	0	0	0
J. Estimated % Canopy Cover:	50		
K. Distance to water feet (m):	7920(2415)		

Footnotes: *Tree species code: DF Douglas Fir
LPP Lodgepole Pine
ASP Aspen

APPENDIX E

Goshawk Prey Items in North America (Jones, 1979)

Table 1. Representative prey species of the goshawk *(Accipiter gentilis)* in North America[1].

BIRDS

Mallard *Anas platyrhynchos*
Blue-winged Teal *Anas discors*
American Kestrel *Falco sparverius*
Blue Grouse *Dendragapus obscurus*
*Ruffed Grouse *Bonasa umbellus*
Willow Ptarmigan *Lagopus lagopus*
*Bobwhite *Colinus virginianus*
*Ring-necked Pheasant *Phasianus colchicus*
Band-tailed Pigeon *Columba fasciata*
Domestic Pigeon *Columba livia*
Common Nighthawk *Chordeiles minor*
Common Flicker *Colaptes auratus*
Pileated Woodpecker *Dryocopus pileatus*
Blue Jay *Cyanocitta cristata*
Steller's Jay *Cyanocitta stelleri*
*Common Crow *Corvus brachyrhynchos*
*Robin *Turdus migratorius*
Yellow-rumped Warbler *Dendroica coronata*
*Blackbirds *Agelaius sp., Euphagus sp., Quiscala sp.*
Savannah Sparrow *Passerculus sandwichensis*

MAMMALS

California Mole *Scapanus latimanus*
Belding Ground Squirrel *Citellus beldingi*
*Arctic Ground Squirrel *Citellus undulatus*
*Golden-mantled Squirrel *Citellus lateralis*
Eastern Chipmunk *Tamias striatus*
*Townsend Chipmunk *Eutamias townsendi*
Eastern Gray Squirrel *Sciurus carolinensis*
*Red Squirrel *Tamiasciurus hudsonicus*
*Chickaree *Tamiasciurus douglasi*
Flying Squirrel *Glaucomys sp.*
Boreal Redback Vole *Clethrionomys gapperi*
*Snowshoe Hare *Lepus americana*
*Eastern Cottontail *Sylvilagus floridanus*
Mountain Cottontail *Sylvilagus nuttali*

1. Not all prey species reported in literature are listed. Sources for food habits data are: Claybaugh (1932), Bent (1937), Bond (1940), Ingles (1945), Alexander (1947), Schnell (1958), Ammann (1959), Meng (1959), Eng and Gullion (1962), Storer (1966), Snyder et al. (1973), and Snyder and Wiley (1976).

*Those species found to be important prey items, making up a significant portion of the diet of goshawks from different areas.